

## WHAT IS CLAIMED IS:

1           1.     A method using a pull cord operatively connected to a rotatable shaft to  
2     reversibly rotate the shaft, the method comprising the steps:  
3                 pulling the pull cord in a first direction, thereby rotating the shaft in a first  
4     direction; and  
5                 pulling the pull cord in a second direction, thereby rotating the shaft in a  
6     second direction, opposite the first direction.

7           2.     A method using a pull cord operatively connected to a rotatable shaft having  
8     a load attached thereto to selectively rotate the shaft in opposite directions and thereby  
9     position the load, the method comprising the steps:

10                (a ) pulling the pull cord in a direction selected from first and second, different  
11     directions, thereby rotating the shaft in a direction selected from first and second, opposite  
12     directions, respectively;

13                (b ) returning the pull cord; and

14                (c ) repeating steps (a) and (b) as required to move the load to a selected  
15     position.

1           3.     A reversible pull cord mechanism, comprising:  
2                 first and second rotatable shafts;  
3                 pull cord means for rotating the first shaft in a selected direction when the pull  
4     cord means is pulled;  
5                 means responsive to pulling the pull cord means in different directions for  
6     rotating the first shaft in a selected direction; and  
7                 means responsive to pulling the pull cord in two of said different directions for  
8     converting rotation of the first shaft in the selected direction into rotation of the second shaft  
9     in two opposite directions.

1           4.     A reversible pull cord mechanism, comprising:  
2                 first and second rotatable shafts;  
3                 pull cord means for rotating the first shaft in a selected direction when the pull  
4 cord means is pulled;  
5                 means for retracting the pull cord means;  
6                 means for converting rotation of the first shaft in the selected direction into  
7 rotation of the second shaft, said converting means being settable in first and second  
8 conditions for respectively converting rotation of the first shaft in the selected direction into  
9 rotation of the second shaft in first and second directions ; and  
10                means responsive to pulling movement of the pull cord means in first and  
11 second directions for selectively setting the converting means in the first and second  
12 conditions as the cord means is pulled.

1           5.     A reversible pull cord mechanism, comprising:  
2                 a retractable pull cord mechanism comprising: a first rotatable shaft; a pulley  
3 operatively connected to the first rotatable shaft for rotating the first rotatable shaft; cord  
4 means wrapped around the pulley for rotating the pulley and the first rotatable shaft when the  
5 cord means is pulled away from the pulley; and means operatively connected to the first  
6 rotatable shaft for rewinding the cord means when the cord means is released;  
7                 a second rotatable shaft operatively connected to the first rotatable shaft for  
8 rotating the second rotatable shaft when the first rotatable shaft rotates;  
9                 shifting means adapted for positioning in first and second positions for  
10 converting single direction rotation of the first rotatable shaft into rotation of the second  
11 rotatable shaft in first and second directions; and  
12                 means connecting the pull cord means to the shifting means for setting the  
13 shifting means in said first and second positions in response to the pull cord means being  
14 pulled in first and second directions.

1           6.     A reversible rotation pull cord mechanism, comprising:  
2                 a retractable pull cord mechanism, comprising: a first rotatable shaft; a pulley  
3     operatively connected to the first rotatable shaft for rotating the first rotatable shaft; cord  
4     means wrapped around the pulley for rotating the pulley and the first rotatable shaft when the  
5     cord means is pulled away from the pulley; and means operatively connected to the first  
6     rotatable shaft for rewinding the cord means when the cord means is released;  
7                 a transmission mechanism including a second rotatable shaft operatively  
8     connected to the first rotatable shaft for rotating the second shaft when the first shaft rotates;  
9     the transmission means further comprising shifting means adapted for being positioned in at  
10    least first and second positions for converting single direction rotation of the first rotatable  
11    shaft into rotation of the second rotatable shaft in first and second directions; and  
12                 means connecting the pull cord means to the shifting means for setting the  
13    transmission mechanism in said first and second positions in response to the pull cord means  
14    being pulled in first and second directions.

1           7.     The reversible pull cord mechanism of claim 6, wherein:  
2                 the transmission mechanism comprises: a first gear operatively mounted on the  
3     first rotatable shaft for rotating therewith in a first direction; a second gear meshed with the  
4     first gear for rotating in a second direction, opposite the first direction; and a third, output  
5     gear; and wherein  
6                 the shifting means comprises fourth and fifth gears; a movable shaft mounting  
7     the fourth and fifth gears at spaced apart locations along said movable shaft with the fifth  
8     gear maintained meshed with the third, output gear; said movable shaft being mounted for  
9     arcuate movement between said first position, at which the fourth gear meshes with the first  
10    gear for rotating the fifth gear with the first gear and said second position, at which the fourth  
11    gear meshes with the second gear for rotating the fifth gear with the second gear; and  
12    wherein

13                   said connecting means operatively connects the pull cord means to said  
14                   movable shaft for moving said movable shaft to the said first and second positions.

1               8.       The reversible pull cord mechanism of claim 7, said connecting means further  
2               comprising: first spring means comprising a first arm or section mounted proximate the  
3               shifting means for rotating movement; a second arm or section mounted proximate one end  
4               to and extending from the first arm and mounted proximate a second end to the movable  
5               shaft of the shifting means for moving the movable shaft between and to said first and second  
6               positions upon rotation of the first arm; and a third arm mounted to and extending from the  
7               first arm for rotating the first arm, thereby pivoting the second arm and moving the movable  
8               shaft between and to said first and second positions.

1               9.       The reversible rotation pull cord mechanism of claim 6, wherein  
  
2                   the transmission mechanism comprises: a first gear operatively mounted on the  
3               first rotatable shaft for rotating therewith in a first direction; a second gear meshed with the  
4               first gear for rotating in a second direction, opposite the first direction; and a third, output  
5               gear; and wherein

6                   the shifting means of the transmission means comprises fourth and fifth gears;  
7               a movable shaft mounting the fourth and fifth gears at spaced apart locations along said  
8               movable shaft with the fifth gear maintained meshed with the third, output gear; said  
9               movable shaft being mounted for arcuate movement among and to said first position, in  
10              which the fourth gear meshes with the first gear for rotating the fifth gear with the first gear,  
11              said second position, in which the fourth gear meshes with the second gear for rotating the

12 fifth gear with the second gear, and a third, neutral position between said first and second  
13 positions at which the fourth gear is disengaged from the first and second gears; and wherein

14 said connecting means operatively connects the pull cord means to said  
15 movable shaft for moving said movable shaft among and to said first, second and third  
16 positions.

1 10. The reversible pull cord mechanism of claim 9, said connecting means further  
2 comprising:

3 first spring means comprising a first arm or section mounted proximate the  
4 shifting means for rotating movement; a second arm or section mounted proximate one end  
5 to and extending from the first arm and mounted proximate a second end to the movable  
6 shaft of the shifting means for moving the movable shaft among and to said three positions  
7 upon rotation of the first arm; and a third arm mounted to and extending from the first arm  
8 for rotating the first arm, thereby pivoting the second arm and moving the movable shaft  
9 among and to said three positions; and the third arm having an aperture therein receiving the  
10 cord in sliding engagement such that pulling the cord in first and second directions moves  
11 the movable shaft to said first and second positions; and

12 second spring means mounted proximate the first spring means and having a  
13 detent positioned such that when the cord is released, the detent releasably engages the first  
14 spring means and positions the first spring means in said neutral third position, and  
15 disengages from the first spring when the cord is pulled in the first or second direction.

1 11. A pull cord-operated retractable cover system, comprising:

2  
3 (1) a cover system comprising: a housing; a plurality of rotatable pulleys  
4 mounted on or to the housing; a cover; cords wound around the pulleys and connected

5 to the cover for extending the cover from the housing and retracting the cover to the  
6 housing; and

7 (2) a reversible pull cord mechanism, comprising:

8 ( a ) retractable pull cord means comprising: a first rotatable shaft; a  
9 pulley operatively connected to the first rotatable shaft for rotating the first  
10 rotatable shaft; cord means wrapped around the pulley for rotating the pulley  
11 and the first rotatable shaft when the cord means is pulled away from the  
12 pulley; and means operatively connected to the first rotatable shaft for  
13 rewinding the cord means when the cord means is released;

14 ( b ) a transmission mechanism including a second rotatable shaft and  
15 being operatively connected to the first rotatable shaft for rotating the second  
16 rotatable shaft when the first rotatable shaft rotates; the transmission means  
17 further comprising shifting means adapted for positioning in first and second  
18 positions for converting single direction rotation of the first rotatable shaft into  
19 rotation of the second rotatable shaft in first and second directions; and

20 ( c ) means connecting the pull cord means to the shifting means and  
21 setting the transmission mechanism in said first and second positions in  
22 response to the pull cord means being pulled in first and second directions.

1 12. The cover system of claim 11, wherein:

2 the transmission mechanism comprises: a first gear operatively mounted on the  
3 first rotatable shaft for rotating therewith in a first direction; a second gear meshed with the

4 first gear for rotating in a second direction, opposite the first direction; a third, output gear;  
5 and wherein:

6 the shifting means of the transmission means comprises fourth and fifth gears;  
7 a movable shaft mounting the fourth and fifth gears at spaced apart locations along said  
8 movable shaft with the fifth gear maintained meshed with the third, output gear; said  
9 movable shaft being mounted for arcuate movement between said first position, in which the  
10 fourth gear meshes with the first gear for rotating the fifth gear with the first gear and said  
11 second position, in which the fourth gear meshes with the second gear for rotating the fifth  
12 gear with the second gear; and wherein:

13 said connecting means operatively connects the pull cord means to said  
14 movable shaft for moving said movable shaft to said first and second positions.

1 13. The cover system of claim 12, said connecting means further comprising first  
2 spring means comprising a first arm or section mounted proximate the shifting means for  
3 rotating movement; a second arm or section mounted proximate one end to and extending  
4 from the first arm and mounted proximate a second end to said movable shaft of the shifting  
5 means for moving said movable shaft between and to said first and second positions upon  
6 rotation of the first arm; and a third arm mounted to and extending from the first arm for  
7 rotating the first arm, thereby pivoting the second arm and moving the movable shaft  
8 between and to said two positions.

9 14. The cover system of claim 11, wherein:  
10 the transmission mechanism comprises: a first gear operatively mounted on the  
11 first rotatable shaft for rotating therewith in a first direction; a second gear meshed with the

12 first gear for rotating in a second direction, opposite the first direction; and a third, output  
13 gear; and wherein:

14 the shifting means of the transmission means comprises fourth and fifth gears;  
15 a movable shaft mounting the fourth and fifth gears at spaced apart locations along said  
16 movable shaft with the fifth gear maintained meshed with the third, output gear; said  
17 movable shaft being mounted for arcuate movement among and to said first position, in  
18 which the fourth gear meshes with the first gear for rotating the fifth gear with the first gear,  
19 said second position, in which the fourth gear meshes with the second gear for rotating the  
20 fifth gear with the second gear, and a third, neutral position between said first and second  
21 positions in which the fourth gear is disengaged from the first and second gears; and wherein:

22 said connecting means operatively connects the pull cord means to said  
23 movable shaft for moving the movable shaft among and to said first, second and third  
24 positions.

1 15. The cover system of claim 14, said connecting further comprising:

2 first spring means comprising a first arm or section mounted proximate the  
3 shifting means for rotating movement; a second arm or section mounted proximate one end  
4 to and extending from the first arm and mounted proximate a second end to the movable  
5 shaft of the shifting means for moving the movable shaft among and to said three positions  
6 upon rotation of the first arm; and a third arm mounted to and extending from the first arm  
7 for rotating the first arm, thereby pivoting the second arm and moving said movable shaft  
8 among and to said three positions; and the third arm having an aperture therein receiving the  
9 cord in sliding engagement such that pulling the cord in first and second directions moves  
10 said movable shaft to said first and second positions; and

11 second spring means mounted proximate the first spring means and having a  
12 detent positioned such that when the cord is released, the detent releasably engages the first



- 13 spring means and positions the first spring means in said neutral third position, and  
14 disengages from the first spring when the cord is pulled in the first or second direction.